AFTER FINAL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

You-seop LEE et al.	Art Unit: 3746
Serial No. 10/757,392	Examiner: Leonard J. Weinstein
Filed: January 15, 2004	Confirmation No. 4957
For: MICRO-PUMP DRIVEN BY PHASE CHANGE OF A FLUID	Attorney Docket No. 249/438

REPLY UNDER 37 C.F.R. § 1.116

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Sir:

INTRODUCTORY COMMENTS

In response to the Office Action Made Final mailed May 7, 2008, the following remarks are respectfully submitted in connection with the above-identified application:

A Listing of the Claims begins on page 2 of this paper.

Remarks begin on page 6 of this paper.

LISTING OF THE CLAIMS

Following is a listing of all claims in the application, which is presented for the Examiner's convenience. No claims are amended by this reply.

Claims:

1. (Previously Presented) A micro-pump comprising:

a pumping chamber to be filled with a fluid;

at least one fluid entrance and at least one fluid exit, each one of the fluid entrance and fluid exit being connected directly between the pumping chamber and a respective manifold;

a heating element at one side of the pumping chamber to generate bubbles in the pumping chamber by heating the fluid; and

electrodes for applying current to the heating element,

wherein a fluid flow into or out of the pumping chamber is by expansion and contraction of the bubbles, and wherein a cross-sectional area of each of the fluid entrance and the fluid exit varies along a direction of the fluid flow to have a constant inclination angle along its entire length, respectively, and

wherein the cross-sectional area of the fluid entrance decreases in a direction toward the pumping chamber, and the cross-sectional area of the fluid exit increases in a direction toward the pumping chamber.

2. (Cancelled).

3. (Previously Presented) The micro-pump as claimed in claim 1, wherein the fluid entrance and the fluid exit are formed to have an inclination angle of about 50° to about 70°.

4. (Previously Presented) A micro-pump comprising:

a pumping chamber to be filled with a fluid;

at least one fluid entrance and at least one fluid exit, each one of the fluid entrance and fluid exit being connected directly between the pumping chamber and a respective manifold;

a heating element at one side of the pumping chamber to generate bubbles in the pumping chamber by heating the fluid; and

electrodes for applying current to the heating element,

wherein a fluid flow into or out of the pumping chamber is by expansion and contraction of the bubbles, and wherein a cross-sectional area of each of the fluid entrance and the fluid exit varies along a direction of the fluid flow to have a constant inclination angle along its entire length, respectively,

wherein the cross-sectional area of the fluid entrance increases in a direction toward the pumping chamber, and the cross-sectional area of the fluid exit decreases in a direction toward the pumping chamber, and

wherein each of the pumping chamber and the heating element has a circular shape.

5. (Original) The micro-pump as claimed in claim 4, wherein the fluid entrance and the fluid exit are formed to have an inclination angle of about 30° or less.

6. (Original) The micro-pump as claimed in claim 1, wherein the fluid entrance is provided at one side of the pumping chamber and the fluid exit is provided at an opposite side of the pumping chamber to face the fluid entrance.

7. (Previously Presented) The micro-pump as claimed in claim 1, wherein each of the fluid entrance and the fluid exit has a pyramid shape.

8. (Previously Presented) The micro-pump as claimed in claim 1, wherein each of the fluid entrance and the fluid exit has a uniform height and a width varying in the direction of the fluid flow.

9. (Previously Presented) The micro-pump as claimed in claim 1, wherein each of the pumping chamber and the heating element has a hexahedral shape.

10. (Cancelled).

11. (Original) The micro-pump as claimed in claim 1, wherein the heating element is formed of a resistive heating material.

12. (Previously Presented) The micro-pump as claimed in claim 1, further comprising a substrate surrounding portions of the pumping chamber, the fluid entrance, and the fluid exit.

13. (Previously Presented) The micro-pump as claimed in claim 12, further comprising an insulation layer between the substrate and the heating element, the insulation layer being in communication with the fluid in the pumping chamber.

14. (Previously Presented) The micro-pump as claimed in claim 13, further comprising a passivation layer on the heating element and the electrodes.

15. (Original) The micro-pump as claimed in claim 14, further comprising a heat dissipation layer formed on the passivation layer for dissipating heat, wherein the heat dissipation layer is connected to the substrate.

16. (Original) The micro-pump as claimed in claim 15, wherein the heat dissipation layer is formed of a metal.

17. (Previously Presented) The micro-pump as claimed in claim 1, wherein the heating element is outside the pumping chamber.

18. (Previously Presented) The micro-pump as claimed in claim 1, wherein at least one of the fluid entrance and the fluid exit includes a surface slanted at an angle with respect to a bottom surface of the pumping chamber.

19. (Previously Presented) The micro-pump as claimed in claim 13, wherein the insulation layer is an upper wall of the pumping chamber.

20. (Previously Presented) The micro-pump as claimed in claim 1, wherein a central axis along a length of each one of the fluid entrance and fluid exit is parallel to a bottom surface of the pumping chamber.